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Conference Abstract

Extending Specify 7 for Geoscience Collections

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Abstract

For over 25 years, the Specify Software team has provided biological research museums and biodiversity repositories with software and technical services for curating, integrating, and publishing collection information. In 2024, with funding from the Swiss Academy of Sciences' SwissCollNet Program and in collaboration with geoscientists from four Swiss natural history museums (located in Bern, Basel, Geneva, and Lausanne), we are extending Specify 7's robust data management platform to include geologic collections via an effort we are calling GeoSpecify.

Computerizing geocollections is similar to biological digitization, but non-trivial distinctions exist between the two areas in data conceptualization and with specimen description and cataloging protocols. These differences challenged us to extend Specify data concepts and to innovate new kinds of collection object data handling. We focused on five areas in our development: multiple distinct object types within a single collection, geologic name classifications, composite collection objects, stratigraphy, and absolute age.

Possibly the most significant extension to Specify will be new support for handling Multiple Object Types (MOTs) within a single collection. A single geology collection might include rocks, minerals, meteorites, and drill cores—all cataloged with their own set of attribute data fields, classifications, controlled vocabularies, numbering series, etc. MOTs will allow the use of data forms customized for each type. For heterogeneous collections, this will eliminate the need to wrestle with generic data forms overloaded with unnecessary fields. Specify users will also have a choice either to assign catalog

numbers for all objects in the collection following the same series, or to assign numbers in type-specific series.

Supporting MOTs will also permit the use of different name classification systems within the same collection. Unlike biological disciplines, geology does not have a single universal classification system of names that can be applied across all types of objects. Instead, classification systems vary depending on the object type, and some are not strictly hierarchical. For example, meteorites, minerals, and rocks are each identified and classified in different ways. Not only are the name authorities distinct, the methods and systems of classification are different. Accommodating all the classification differences in a single collection classification tree would create an unbalanced and unwieldy data structure. Because of this, we extended Specify to work with multiple name sources within a single collection, each keyed to a particular object type.

Another development from our GeoSpecify collaboration will be Specify's support for the description of collection objects composed of more than one part, or composite collection objects. Composite collection objects are common in geologic collections with multiple minerals (or fossils) found within the same rock substrate or plate, or with drill cores. Each of the constituent parts in a single physical composite collection object may have its own identification, stratigraphy, or age, requiring adding it into Specify as an individual Collection Object record. Thus a single physical object may be represented by several Collection Object records in Specify. To support this, we will enhance our previous "Container" implementation into a more flexible grouping method known as Collection Object Groups (COGs).

COGs will enable full documentation of all the components of a composite collection object by allowing the user to create a Collection Object record for each part of the composite object, and then to permanently associate those records together. COGs will group Collection Object records representing both physical (objects that are currently joined) and logical (objects that were once combined in situ or when the specimen was alive, but which are currently discrete) relationships. COGs will allow users to assign catalog numbers to one, some, or all parts of a composite collection object. For physically related specimens like a rock with multiple embedded minerals or fossils, COGs will ensure that for collection management actions like loans, all of the component collection objects in a COG will be flagged as participating in a transaction without having to manually identify the associated objects.

Next, our GeoSpecify effort will extend the concept of Stratigraphy in the data model to allow users to more thoroughly document geological specimens' relational context. Defining an object's stratigraphic origin is essential for geological collections. With this extension, not only will a Specify user be able to define chronostratigraphy, biostratigraphy, and lithostratigraphy information about a specimen as they always have, but they will also be able to catalog the object's magnetostratigraphy and tectonostratigraphy information.

And finally, the ability to document an absolute age will be added. To describe an object, geological collections use both relative age, such as a stratigraphic name, which Specify already documents, and absolute age. While relative age documents an object's age relative to another object, essentially saying the object is older or younger than something else, absolute age gives a numeric age to an object, typically as the result of a dating method such as thermoluminescence. Both the method of dating the object and the resulting data are very different, thus requiring different fields and tables. Specify will allow the user to document the relative or absolute age, date, uncertainty, date range, and dating method. This new addition created a conundrum for us because the age information would be spread across several different fields and tables, making it difficult for users to search an object's age. Thus, we will enhance Specify's search functionality to allow searching all age data, relative and absolute, both by age names and dates, including factoring in uncertainties.

With the expansion of Specify into earth sciences, thanks to the collaboration and investment of our Swiss museum partners, Specify Collections Consortium museums will now be able to manage data from their biological and geological collections in a single robust database platform.

Keywords

Specify Collections Consortium, SCC, GeoSpecify, geology, collection management, software

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Conflicts of interest

The authors have declared that no competing interests exist.